# Space Weather Technical Forecast

Issued on Tuesday, 26 October 2021 at 01:26 Local

**This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales**

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**Space Weather Forecast Headline: Daily Slight Chance of M-class flares.**

**Analysis of Space Weather Activity over past 24 hours**

**Solar Activity:** Solar activity was Low through the period, with two C-class flares observed, these both during the evening of 25th UTC from a region just around the eastern limb. There are currently five numbered sunspots regions on the visible disc. AR2886 (Hsx/Alpha) in the southwest quadrant remains a single and simple uni-polar spot and remains stable. AR2887 (Dki/Beta-Gamma) is the largest sunspot on the disc, which is located in the southeast quadrant. It remains magnetically complex, with continued changes to its intermediate spots. Despite its magnetic complexity, there has been very little activity from this region. AR2888, in the east quadrant, remains a small and simple Axx/Alpha. AR2890, to the west of AR2886, has shown some growth with several small spots developing, classified as a relatively simple Bxi/Beta. Finally, AR2889 to the south of AR2888 has recently developed with several small spots developing in an open configuration where a plage region exists, currently classified as a Bxo/Beta. No Earth directed CME's have been observed in available imagery.

**Solar Wind / Geomagnetic Activity:** The solar wind, as measured by DSCOVR at L1, was at background levels throughout, ranging between 300 km/s to 360 km/s. The solar wind density was initially average, then rose above average between 25/1130-1700UTC with a peak around 28ppcc at 25/1500UTC. The IMF Bt was weak, with a brief peak to moderate (9nT) at 25/1530UTC. The north-south component was subsequently weak ranging from -5/+6 Bt. The phi angle remained almost exclusively negative (towards the sun). Resultant geomagnetic activity was Quiet (Kp 0-2) with one Unsettled interval (Kp 3).

**Energetic Particles / Solar Radiation:** The high energy proton flux (greater than 10MeV) as measured by GOES-16 was at Background levels, with no solar radiation storms observed. High energy electron flux (greater than 2MeV) was predominantly at background levels. Associated 24-hour electron fluence was well below the Active (1e8 integrated pfu) threshold, with 1.63e6 integrated pfu recorded at 26/0000UTC.

**Four-Day Space Weather Forecast Summary**

**Solar Activity:** There is a daily Slight Chance of M-class flares, largely the result of the complexity of AR2887, although this has yet to be borne out in observed X-ray activity. There is a possible returning region just over the northeast limb that may yet increase probabilities over the next few days, however these do not yet feature in the percentages.

**Solar Wind / Geomagnetic Activity:** No Earth-directed CMEs feature in this forecast period. CH15/+ is expected to become geoeffective early on Day 3 (28th). Due to its positive orientation and given it remains connected to the northern polar crown, a slight enhancement of solar wind speed is possible, perhaps bringing brief Unsettled or Active intervals on Day 3 in an otherwise Quiet geomagnetic period.

**Energetic Particles / Solar Radiation:** The high energy (greater than 10 MeV) proton flux is

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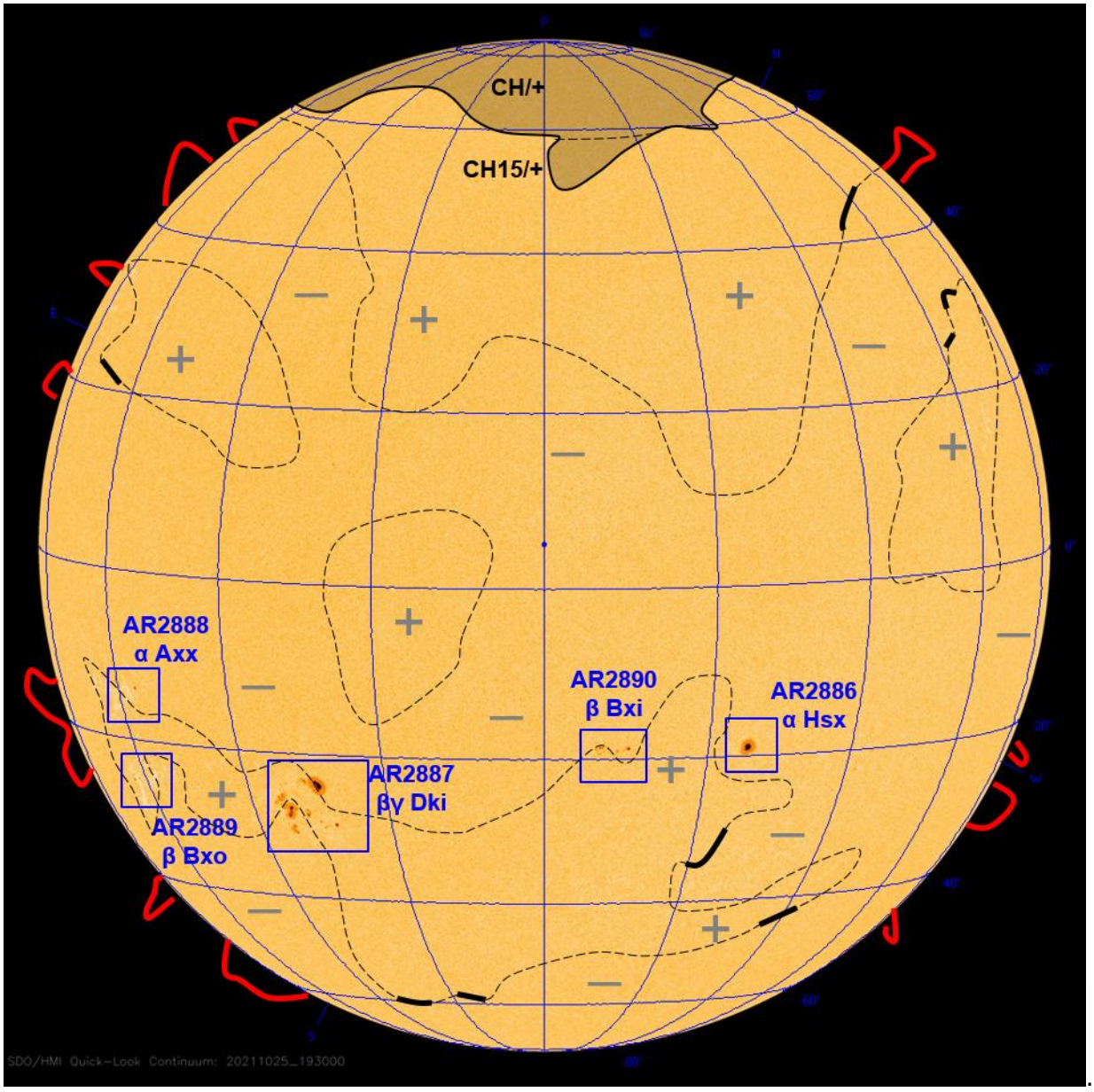
expected to remain at Background levels, with no solar radiation storms currently expected. The high energy electron flux (greater than 2MeV) is likely to remain at Normal Background levels, with the 24-hour fluence expected to remain well below Active.

**Figure 1. Solar Analysis Valid 25/2000UTC.**




**Key:** Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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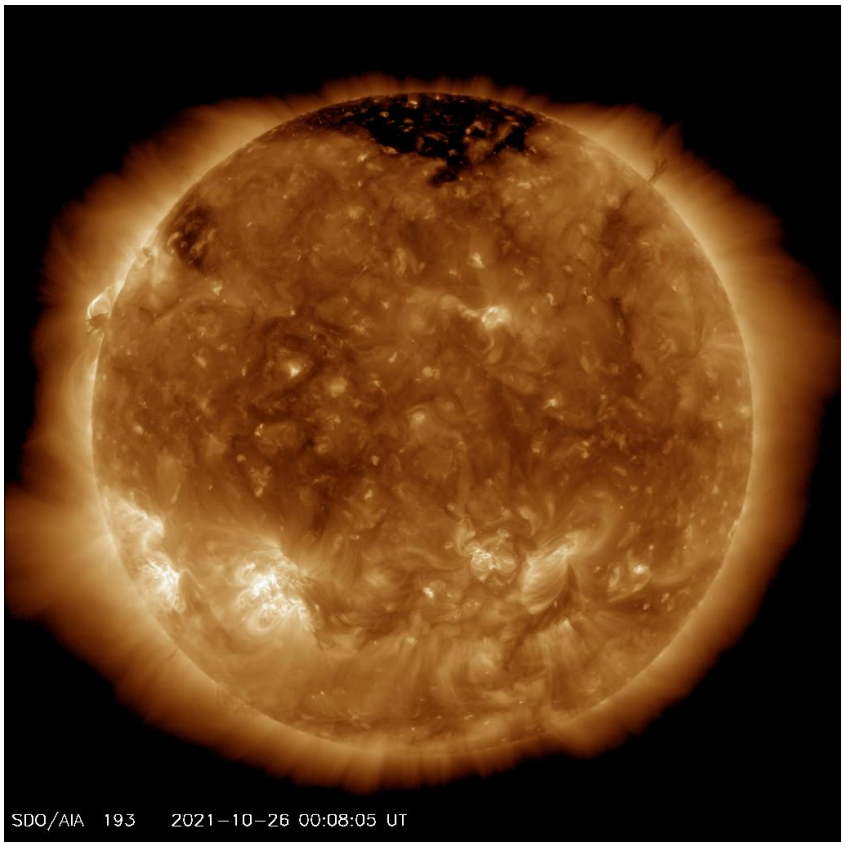
## Geomagnetic Storms:

No Earth-directed CMEs are expected during the period. CH15/+, a southern extension of the northern polar crown, is expected to become geoeffective sometime early day 3 (28th). STEREO A PLASTIC data measurements show a generally slow solar wind environment for the period, though increases in density have been observed. There remains the possibility that CH15/+ may bring a slight enhancement to solar winds, perhaps bringing a chance of brief Unsettled or Active intervals. The risk of any minor geomagnetic storms is considered to be very low.

| Geo-Magnetic Storm Probability (Exceedance) | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Minor or Moderate | G1 to G2 | No | 1 | 2 | 5 | 2 |
| Strong | G3 | No | 1 | 1 | 1 | 1 |
| Severe | G4 | No | 1 | 1 | 1 | 1 |
| Extreme | G5 | No | 1 | 1 | 1 | 1 |

**Figure 2: SDO 193 imagery depicting CH15/+.**

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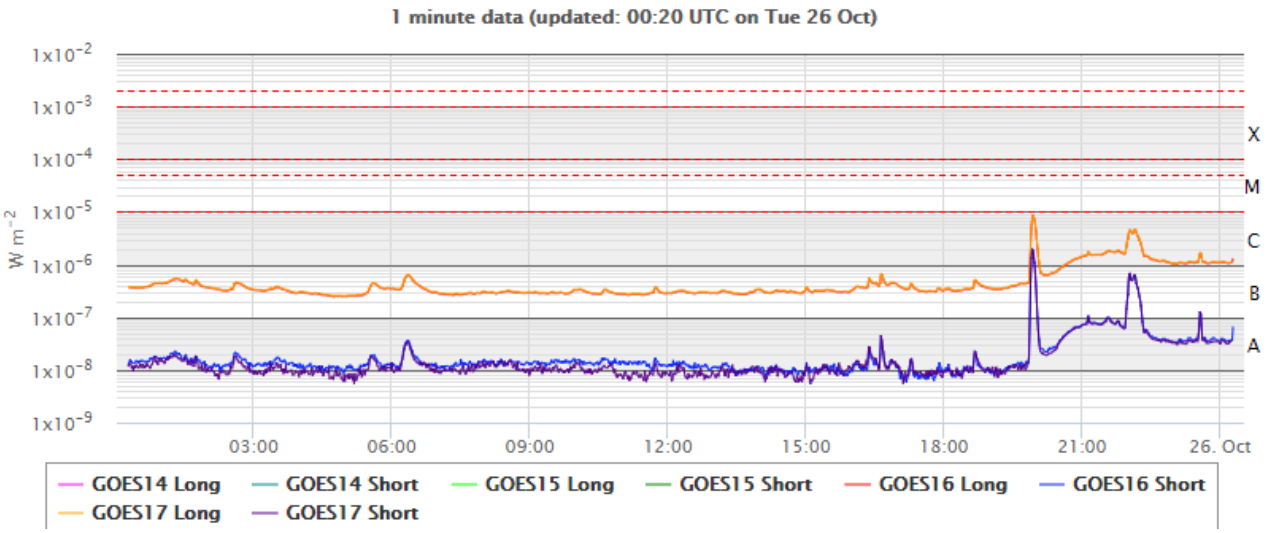
## Radio Blackouts - X-Ray Flares:

There is a daily Slight Chance of M-class flares. This is largely the result of sunspot region AR2887 in the southeast quadrant, which is currently assessed as a Dki/Beta-gamma complexity and continues to show a slight growing trend. The prospects for significant X-ray activity may increase later in the period however, as there is a bright flux region lying around the northeast limb which has been the subject of several CME's and flares over the past few days. This may increase the flare risk as it rotates onto the visible disk in the next 24 hours. The risk of significant flares is held at a daily Slight Chance for M-class and a non-zero risk of X-class.

| X Ray Flares<br>Probability | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC)<br>(%) | Day 2 (00-24 UTC)<br>(%) | Day 3 (00-24 UTC)<br>(%) | Day 4 (00-24 UTC)<br>(%) |
|---|---|---|---|---|---|---|
| Active | R1-R2 M Class | No | 20 | 20 | 20 | 20 |
| Very Active | R3 to R5 X Class | No | 2 | 2 | 2 | 2 |

**Figure 3: X-ray trace.**

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## Solar Radiation Storms - (High Energy Protons):

With no significant sunspots in geoeffective positions on the Sun, solar radiation storms are currently not expected.

| Radiation Storms Probability (Exceedance) | Level ($cm^{-2}$ $sr^{-1}$ $s^{-1}$) | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| **Active** | **≥ S1** | No | 1 | 1 | 1 | 1 |
| **Very Active** | **≥ S3 *** | No | 1 | 1 | 1 | 1 |

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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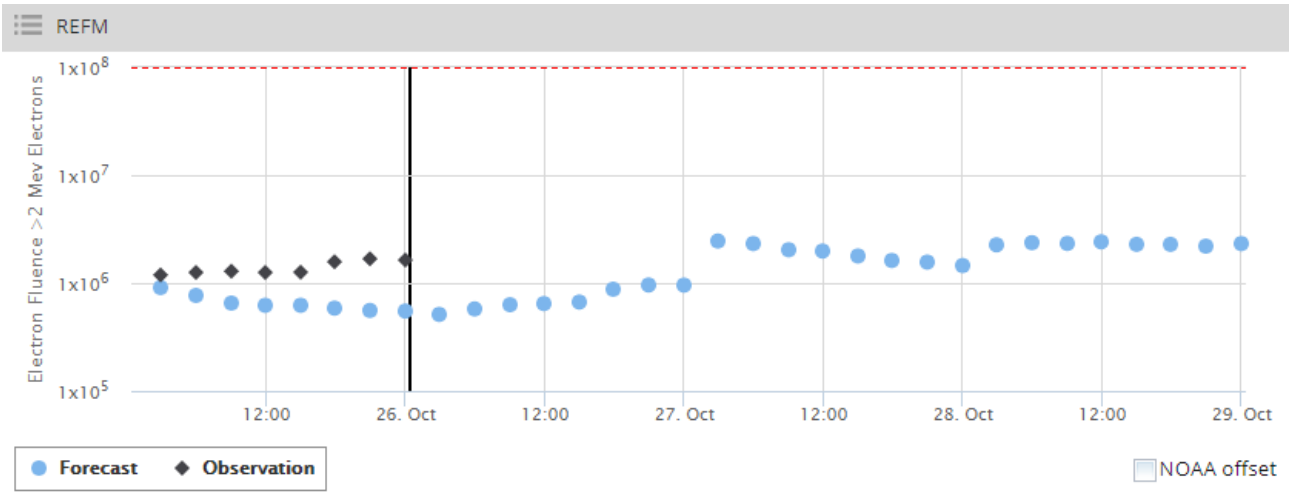
## High Energy Electrons Event (≥ 2MeV):

The high energy (greater than 2 MeV) electron flux is currently at Normal Background levels, with no further enhancements expected in the four-day forecast period sub-Active fluence should persist throughout.

| GEO Electron Environment | Level ($cm^{-2}$ $sr^{-1}$ $day^{-1}$) | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) | Day 2 (00-24 UTC) | Day 3 (00-24 UTC) | Day 4 (00-24 UTC) |
|---|---|---|---|---|---|---|
| Probability (Exceedance) | | | (%) | (%) | (%) | (%) |
| Active | ≥ 2 MeV ≥ $1x10^8$ | No | 1 | 1 | 1 | 1 |
| Very Active | ≥ 2 MeV ≥ $1x10^9$ | No | 1 | 1 | 1 | 1 |

**Figure 5: Electron fluence obsevations REFM forecast.**

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